DEMONSTRATION 9.2

CHROMATE/DICHROMATE EQUILIBRIUM

This demonstration illustrates the effect of acid and base on the equilibrium between chromate and dichromate ions.

EQUIPMENT

- 4 x 1 L flasks with corks (labelled 1 to 4)

REAGENTS

- potassium chromate, K_2CrO_4 (4 g)
- potassium dichromate, $K_2Cr_2O_7$ (6 g)
- hydrochloric acid, HCl (3 M, 500 mL)
- sodium hydroxide, NaOH (3 M, 500 mL)

PREPARATION

- Dissolve 4 g of K_2CrO_4 in 1 L of water.
- Dissolve 6 g of $K_2Cr_2O_7$ in 1 L of water.
- In the flasks labelled 1 and 2 place half of the K_2CrO_4 solution, and in flasks 3 and 4 place half of the $K_2Cr_2O_7$ solution.
- To flasks 1 and 3 add 250 mL of HCl (3 M) and to flasks 2 and 4 add 250 mL of NaOH (3 M) solution.

RESULTS

The equilibrium between chromate and dichromate ions is:

$$2CrO_4^{2-}(aq) + 2H^+(aq) \; \Gamma \; Cr_2O_7^{2-}(aq) + H_2O(l)$$

Addition of acid shifts the equilibrium to the right causing the orange dimeric dichromate ion to dominate. The addition of hydroxide removes protons from the equilibrium causing a shift to the left and the yellow chromate ion dominates.

CAUTION

Chromium(VI) is carcinogenic.